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Eighty-four presents were announced as having been received since the last ordinary meeting, including, amongst others:

Specola Vaticana, Catalogo Astrografico, vol. v.; zona + 60°; presented by the Observatory.

Photographs of the Interferometer, 100-inch Hooker telescope, Mount Wilson Observatory (eight lantern slides); presented by Prof. G. E. Hale.

Note on the Comparison of Trigonometric Parallaxes with Spectroscopic. By H. H. Turner, D.Sc., F.R.S., Savilian Professor.

1. A volume just issued from the Leander M'Cormick Observatory gives splendid evidence of work done in the list of 260 trigonometric parallaxes determined photographically. There is, moreover, a comparison of 194 of these with spectroscopic parallaxes, determined at Mount Wilson and kindly communicated in advance by Mr. W. S. Adams. Mr. S. A. Mitchell has subtracted 0″·005 from the spectroscopic parallaxes (S) to make them comparable with the trigonometric (T), which are relative to comparison stars of about magnitude 10. Would it not have been better to increase T rather than diminish S?

2. But there is another obvious reason why S should exceed T when T is near zero. S is necessarily always positive, even when in error, for it is the reciprocal of a real distance, while T is often negative owing to accidental error. This characteristic difference is rendered conspicuous if we arrange the comparison according to T, so that we get a group of negative T's all with positive S's. We might fully concede Mr. Mitchell's claim that T is not sensibly affected by systematic error without upsetting this discrepancy. The Leander M'Cormick list contains 2, 7, 9, and 6 negative parallaxes in classes F, G, K, M, respectively, and the mean T for these 24 stars is −0″·008, while the mean S is +0″·018 when we restore the subtracted 0″·005. But an arrangement in order of T is clearly inappropriate; it is better to take S as the independent variable.

3. We may further remark that a small S must be much more accurate than a small T. Thus, if the true parallax of a star is 0″·005, the observed T may deviate on one side or the other just as much as if the true parallax were 0″·500; but the observed S cannot be more than 0″·005 in defect, and is probably not more than 0″·002 in defect. As regards excess, the deviation of S is not so strictly limited, but it would certainly be smaller than for a 0″·500 star. This brings us to the point that, since there is more room for error in excess, small S parallaxes will probably err in excess on the average. The errors are due to a complex of causes, and before attempting analysis of them it is well to examine the actual results.

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4. Let us, then, arrange the copious material put into our hands by Mr. S. A. Mitchell in order of S. In doing so the different spectral classes were at first kept separate, but there did not seem to be any great difference between them, and it will suffice here to group them all together. The correction of − 0″·005 to S has been annulled in the following table:—

Comparison of Spectroscopic (S) and Trigonometric Parallaxes (T).

(The unit is 0″·001 throughout.)

Limits of S.	No. of Stars.	Mean S.	Mean T.	Observed S − T.	Adopt.
3– 11	11	+ 7	+ 6	+ 1	+ 5
12– 15	12	+ 14	+ 16	− 2	+ 5
16– 19	10	+ 17	+ 7	+ 10	+ 6
20– 23	22	+ 22	+ 17	+ 5	+ 6
24– 29	18	+ 28	+ 17	+ 11	+ 7
30– 38	26	+ 34	+ 30	+ 4	+ 9
40– 48	21	+ 41	+ 32	+ 9	+ 11
50– 63	19	+ 56	+ 38	+ 18	+ 13
66– 79	12	+ 72	+ 60	+ 12	+ 11
83–100	14	+ 89	+ 81	+ 8	+ 9
105–120	11	+ 112	+ 108	+ 4	+ 7
138–200	11	+ 165	+ 171	− 6	+ 5
209–358	7	+ 284	+ 279	+ 5	+ 5

5. Thus rough justice is done by the subtraction of a constant from S, except at the ends of the table. It is submitted, however, that the excess of S increases from zero when S = 0 to a maximum of about 13 when S = 0″·060, and then diminishes to zero; and that this is more or less what we might expect if the excess is partly due to the cause above indicated. Part of it, however, must be due to the neglected parallaxes of the comparison stars in T; though it is difficult to find room for this correction in the case of the first two groups. If T is increased by 0″·005 as suggested, the values of S − T for the first two groups will become − 0″·004 and − 0″·007. For the present we must apparently treat these as accidental errors and suggest something like the column "Adopt" as the difference between S and T, of which 0″·005 is to be added to T and the remainder subtracted from S.

6. It is, however, not without hesitation that this suggestion of correcting S parallaxes is made. The greatest correction is about ″·013 − ″·005 = ″·008 for an S parallax of 0″·056, say: not, perhaps, an excessive modification. But it is only put forward

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as a possibility. To confirm it we require a scrutiny of the contributing causes, viz.:—

(1) Errors in the adopted apparent magnitudes of the stars.
(2) Errors in the estimated relative intensities of the spectrum lines used for getting absolute magnitudes.
(3) Errors in the empirical curves used in deducing the absolute magnitude.

(1) and (2) might be discussed from general considerations, but (3) is difficult for anyone not working at the actual method.

7. A supplementary or perhaps completely alternative suggestion is that it is the T parallaxes which are in error and require correction by the column headed "Adopt," on account of the parallaxes of the comparison stars. The fundamental assumption made in observing trigonometrical parallaxes is that the star selected is near us and the comparison stars are beyond it But this is liable to the kind of mistake which Sir William Herschel made a century ago, and which led to his discovery of binary stars: viz. some of the comparison stars may be physically associated with the main stars. For conspicuous parallaxes this association would be readily detected and allowed for, and we may assume that this source of error is eliminated. But for the smaller parallaxes it would not be so easy to detect the association without an equally elaborate determination of each comparison star. Hence it may be that the relative parallaxes are reduced. For parallaxes near zero the consequent error might be reversed in sign. There are probably some stars in the list with absolute parallaxes less than 0″·005, the assumed parallax of the comparison stars. An associated companion would thus also have a parallax in defect instead of in excess. This might explain the apparent anomaly of the above list for the small parallaxes. On the whole, it seems preferable to attribute the difference between S and T to error in T from this cause (liability of the comparison stars not to be independent of the main star) rather than to error in S (from greater facility of errors in excess rather than defect).

Summary.

The Leander M'Cormick parallaxes show a curious difference from spectroscopic parallaxes, for which two possible causes are suggested.

[*Note added March* 24.—Since the above was sent to press, the Jan. *Ap. J.* with Adams's 1646 parallaxes has been received. A brief examination of the T parallaxes of stars for which S lies between ″·040 and ″·060 shows that the difference S – T is very small indeed. Hence there is no *general* systematic error of the kind above noticed, and we must consider it peculiar to the Leander M'Cormick parallaxes, as suggested on p. 29 of the paper cited.]

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The Real Motion of the Stars. By George Forbes, M.A., F.R.S.

Voûte's catalogue contains radial velocities of 2071 stars, with Boss's proper motions of most of them, and parallaxes of 423 stars. This paper is only a preliminary survey for deciding upon the best methods for utilising the catalogue, and for discovering new facts about star-streams. It deals only with stars of high radial velocity. Fig. 1 shows the positions, in galactic longitude and latitude, of stars whose radial velocities are ± 90 km./sec. or more. Fig. 2 shows the same for stars with radial velocities between 40 and 90 km./sec. Kapteyn's Stream I. corrected for solar motion has its apex (+) at gal. long. 346°; lat. 0°; Stream II. at 166°. Among high-velocity stars fig. 2 shows some slight evidence of the

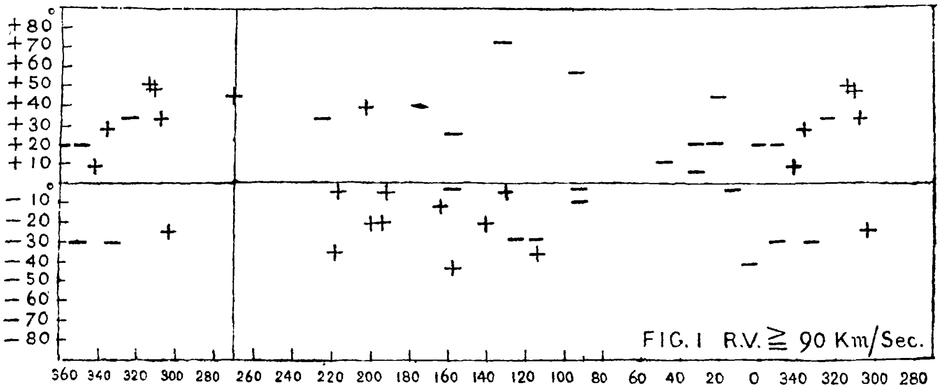

FIG. 1 R.V. ≧ 90 Km/Sec.

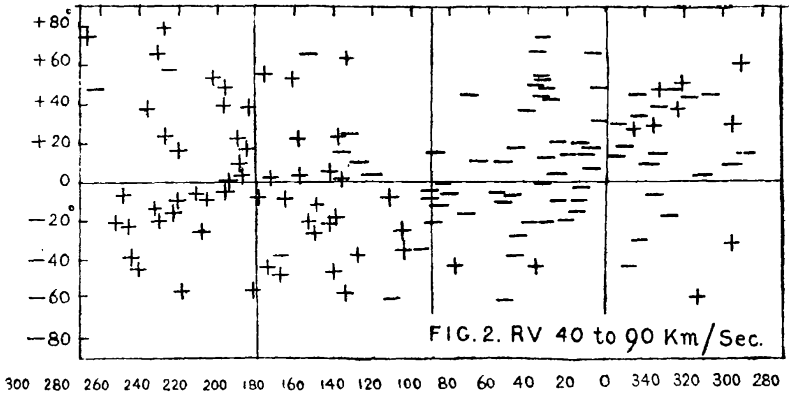

FIG. 2. RV 40 to 90 Km/Sec.

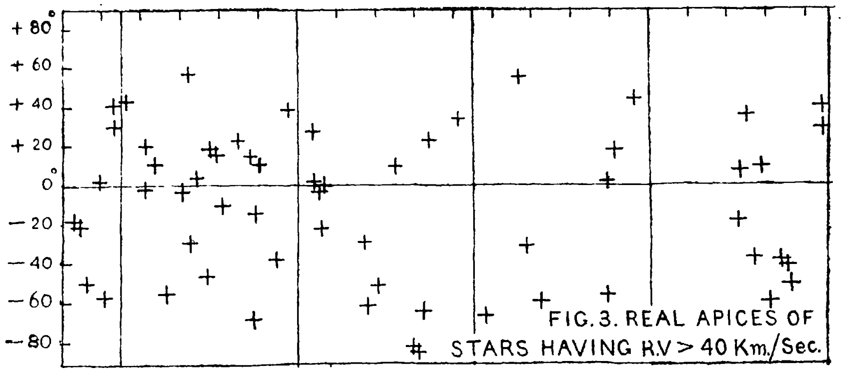

FIG. 3. REAL APICES OF ⧺ STARS HAVING R.V > 40 Km./Sec.

Voûte. First Catalogue of Radial Velocities.